

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

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Region - Five

COPY

REPLY TO: 5230 Evaluation 3500 acres

March 31, 1978

SUBJECT: Status Report - Jeffrey Pine Needle Miner

TO: Forest Supervisor, San Bernardino N.F.



Enclosed is a status report of the Jeffrey pine needle miner (JPNM). In preparing this report, we have attempted to formulate the known factual information into a reasonable approach to pest management in the short run. That approach is covered in the Discussion, pages 3-5.

We visualize this approach accomplishing these things:

1. The brochure -- should be a simple, straight-forward pamphlet providing a brief background and description of the life history and habits of the JPNM. Assuming we are successful in obtaining a third party registration of Orthene, information on insecticidal treatment would be indicated as available through Cooperative Extension, the County Agricultural Commissioner or the CDF.
2. The monitoring -- should provide for the accumulation of subjective and quantified data which, over time, should suggest other options for managing the forest environment in light of the "new" inhabitant.
3. The insecticidal control -- should provide an alternative for land owners whereby they can opt for direct remedial control to improve and maintain the appearance of individual high value trees.
4. Stand improvement -- should improve or maintain the vigor and appearance of the managed stands and provide long term reduction of insect and disease impacts.

Jere Mitchell has reviewed and commented on the report while here in the RO on detail. Please contact me directly with any questions or concerns we may have overlooked in preparing the report.

Wilfred L. Freeman, Jr.

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Status Report
Jeffrey Pine Needle Miner
San Bernardino National Forest

I. Introduction

Pest management decisions should be made within the context of the resource management goals and objectives for the pest affected area(s). The primary management goals for the San Bernardino and the other three Southern California National Forests, as stated in the Draft Environmental Statement-Timber Management Plan (1977) for these forests, are as follows:

1. Maintain attractive forests for recreational use and enjoyment.
2. Provide protection from excessive insect or disease losses.
3. Provide favorable conditions for maintenance of water flow and yield.
4. Reduce the potential for loss of forested area to uncontrolled fire.
5. Maintain or enhance wildlife and fisheries habitat, and provide necessary protection for areas designated as critical habitat for threatened and endangered species.
6. Utilize trees removed from the forest - as a result of implementing stand treatments to achieve the preceeding goals - for fuelwood, posts, poles, sawlogs, or other useful forest products.
7. Provide educational and interpretive services which foster public understanding of natural processes and management of forest ecosystems.

The San Bernardino National Forest and surrounding areas are easily accessible to the 13.5 million residents of the South Coast Basin. The San Bernardino is the most heavily used National Forest in the nation with 5.8 million visitor use days in 1974. Coupled with the number of permanent residents and dwelling units, the impact of human activity on the San Bernardino Mountains "ecosystem" is considerable.

II. Background

In contrast to the bark beetle situation in the San Bernardino Mountains, where suppression efforts were initiated against the western pine beetle in 1921, concern over the Jeffrey pine needle miner (JPNM) is relatively recent. The first visible sign of JPNM-caused damage was reported in 1963. Since that time, the infestation has spread to the extent that by 1975, damage was reported on approximately 3,500 acres. The U.S. Forest Service, the California Department of Forestry, the Cooperative Extension Service, County Agricultural Commissioner, local government and private land owners have become increasingly concerned over the needle miner's impact on the forest resource values and management objectives. This report summarizes the current available information on the JPNM.

III. Causal Agent and Host

The Jeffrey pine needle miner, Colcotechnites sp., (Lepidoptera:Gelechiidae) has been recorded from a single host tree, Jeffrey pine, Pinus jeffreyi Grev. and Balf., in the San Bernardino Mountains. Taxonomically, the JPNM appears somewhat similar to C. milleri (Busck) and C. starki (Freeman) which occur on lodgepole pine, P. contorta Dougl., in California and Canada respectively. Colcotechnites spp. have also been reported on lodgepole pine in Idaho and Oregon, ponderosa pine, P. ponderosa in Colorado, and pinyon pine, P. edulis in New Mexico.

IV. Distribution

The JPNM was first detected on Jeffrey pine in Snow Valley, San Bernardino County, California in 1963. The needle miner has not been reported from areas outside the San Bernardino Mountains, but has expanded its range locally and now occurs in Snow Valley, Green Valley, Arrowbear, Big Bear Lake, Big Bear City and Barton Flats. The initial infestation at Snow Valley covered approximately 5 acres, but by 1975 about 3,500 acres were reported infested, representing both expansion of existing infestation centers and detection of new centers. To date, the infestations have occurred between 2000-2150m (6570-7095 ft.) largely within drainage or Valley bottoms. Many of the infestations are associated with developed residential and recreational areas.

V. Biology

The JPNM completes one generation per year (Luck, 1976). Adult females lay eggs during an approximate four week period beginning in mid-August. Eggs are normally laid in clusters of from 2-5 eggs within needles mined by previous generations. Larvae hatch from mid-September to mid-October. These first-instar larvae migrate to an uninfested needle, bore into the needle near the apex, and begin to mine the needle. The larvae overwinter in the first instar and resume feeding the following spring. Between April and July, three more larval instars occur, each feeding and tunneling within the original needle. Pupation occurs within the mined needle beginning about the second week in July, with adults appearing again in August.

VI. Damage

JPNM affects a wide range of age and size classes of Jeffrey pine. Few trees, if any, have died as a direct consequence of JPNM activity. Although not substantiated by actual data, it is likely that needle miner activity on the same tree over several consecutive years would cause some growth loss. It is also possible that the JPNM may weaken trees and thus predispose them to increased risk of attack by secondary insects and diseases. However, to date, the main cause for concern over the JPNM is with its visual or aesthetic effects -- the mined needles turn reddish brown and present a "scorched" appearance. Trees that have suffered several years of needle miner activity

tend to have fewer and shorter needles, short internodes and dead and dying twigs and branches. Needle miner larvae mine only the distal 1/3 to 1/2 of a single needle per year. Few of the current year's needles are attacked, as the newly hatched larvae must move to the unmined needles each fall from the egg laying sites in the older previously mined needles. This may, in part, explain why little JPNM caused mortality has been observed and why trees that have been heavily attacked for several years have only the terminal needle complements remaining.

VII. Discussion

The areas with the greatest amount of needle browning due to the JPNM have been associated with heavily used and developed areas. It is difficult to establish a cause and effect relationship because to a certain extent, these areas also coincide with concentrations of Jeffrey pine, the only known host of the JPNM. Although a number of insects parasitic on the JPNM are known to be present in the areas, the infestation has persisted for 15 years. The JPNM parasite complex is similar to that of other Coleotechnites sp., and it is postulated that hyperparasites may be preventing the primary needle miner parasites from regulating the JPNM population (Luck 1976). One of the things which appears to be limiting JPNM numbers to a certain degree, is the availability of previously mined needles for egg laying sites. When most of the suitable previously mined needles are occupied, few additional eggs can be laid and the population should stabilize or decline. It has been suggested that JPNM numbers in the oldest parts of the infestation have reached these levels and further population increases in these areas are unlikely (R. Luck, personal communication).

The JPNM is one of a number of abiotic and biotic factors affecting the vigor of Jeffrey pine in the San Bernardino Mountains. Management plans for the JPNM infestation areas should recognize and include the factors appropriate for each stand. Although there is no apparent relationship between the distribution of the JPNM and oxidant air pollution gradients, some trees show symptoms of both. Roadside trees are extremely important in terms of visual impact and on some of these trees, the effects of JPNM feeding has been confused with, or compounded by the effects of salt used for road de-icing. Two disease organisms present in the JPNM infestation areas will continue to reduce the vigor of infected trees. Very heavy dwarf mistletoe in areas such as Snow Valley will predispose the infected trees to attack by bark beetles. Several small Fomes annosus centers are also present in the area and pines will continue to die around the edges of these centers for some time. Even in the absence of the JPNM there will be some needle discoloration and tree mortality due to the number of other things affecting the trees.

Nonetheless, for practical purposes, the JPNM must be considered as part of the San Bernardino Mountain ecosystem. Under these conditions, Region 5, Forest Insect and Disease Management Staff is pursuing four approaches to the problem:

- (1) Continued Monitoring: FIDM will continue to monitor the needle miner situation using information provided through field surveillance and, as necessary, detection surveys. This effort will focus on surveillance of known centers of infestation and the discovery of new infestations plus observations on changes in feeding intensity.
- (2) JPNM brochure: As per prior agreement (re: letters 8/18/76; 2/14/77), FIDM will provide technical review and clarification for a public oriented brochure explaining the JPNM situation. FIDM will work with the San Bernardino National Forest as necessary, with the brochure to be published at FIDM expense by June 1.
- (3) Insecticides: In response to the intense public interest in the JPNM, the Forest Service, FIDM-Region 5, the Pacific Southwest Forest and Range Experiment Station and the University of California at Riverside have cooperated in evaluating promising insecticides for use against the JPNM. The primary purpose of this effort was to find an insecticide(s) effective against the JPNM and to obtain data for use in support of registration of the material(s). The intent was not to attempt to suppress JPNM populations over large areas, but to find an insecticide that could be used by land owners on individual, high value, trees to reduce the number of mined needles and thus make the trees look "greener" or less "scorched" relative to untreated trees.
 - (A) Insecticide Evaluations: Between 1975 and 1977, eight promising candidate insecticides were tested against various life stages of the JPNM (Brown and Eads, 1976; Robertson et al., 1977; Brown et al., 1977). The results of these tests indicated that the most promising material, in terms of causing larval mortality, was the systemic insecticide Orthene, applied as a foliar spray, trunk injection or implantation or by the Medicap injection system (Brown et al., 1977). The trunk injection systems appear to be preferable because they affect the larvae more quickly after the time of application and cause a higher degree of mortality than the foliar spray. Additionally, there would be fewer potential environmental side effects because drift would not be a factor and they would be easier to apply. However, depending on the number of times an individual tree would have to be treated to achieve the desired effect, the physical impact of the injection devices would need evaluation before the method could be recommended. Also, the tests referred to above were conducted on small trees (2.2-8.3 DBH) and consequently the effectiveness of the trunk injection systems in large trees (translocation and dilution problems) and phytotoxicity considerations need to be addressed.

The foliar spray thus seems, at this time, to be the best chemical alternative. Effectiveness of this method still depends on adequate coverage, and tree size may again be a problem, as would spray drift and environmental contamination (Orthene concentrates in avian brain cholinesterase and 5-10% decomposes in the soil to form Monitor, a metabolite of Orthene and a patented, registered insecticide in its own right). It should also be emphasized that even with an effective treatment, affected trees will not "green-up" immediately after treatment, but instead will require several years of needle production to recover.

- (B) Registration: Orthene is currently registered against the gypsy moth on several hosts. The consensus of opinion at this time is that the studies referred to above have resulted in data adequate to pursue a PEPS-Special Local Need Registration of Orthene against the JPNM in the San Bernardino Mountains.

FIDM has contacted the Chevron Company, producers of Orthene, concerning such a registration. Chevron's position is that they will not pursue the registration themselves, but they would support a third-party registration application. FIDM feels that, given the nature of the JPNM situation, it would be appropriate for the San Bernardino County Agricultural Commissioner or perhaps for the California Department of Forestry to be the "third party" applicant. Accordingly, FIDM has encouraged and is actively assisting the various State and County agencies in applying for the Special and Local Need registration.

- (4) Stand Improvement: FIDM will continue to encourage management of affected stands or areas through the use of silvicultural prescriptions designed to minimize the impact of the insect and disease complex affecting the particular stands. Protection from excessive insect and disease losses over the life of a stand can best be achieved by creating favorable conditions for tree growth and vigor through appropriate management techniques.

REFERENCES

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